## REMARKS

In the last Office Action, the Examiner rejected claims 15-19 under 35 U.S.C. §112, second paragraph, for indefiniteness. Claims 1, 2, 15/1, 21/1 and 21/2 were rejected under 35 U.S.C. §102(a) as being clearly anticipated by U.S. Patent No. 4,692,649 to Izukawa et al., U.S. Patent No. 5,001,404 to Kataoka, U.S. Patent No. 5,438,229 to Ohtsuchi et al. or U.S. Patent No. 5,821,667 to Takagi et al. Claims 3, 4, 10, 15/3, 21/3 and 21/4 were rejected under 35 U.S.C. §102(a) as being clearly anticipated by Izukawa, Kataoka or Ohtsuchi. Claims 5 and 15/5-21/5 were rejected under 35 U.S.C. §102(a) as being clearly anticipated by U.S. Patent No. 5,198,714 to Salomon et al., U.S. Patent No. 5,406,160 to Shirasaki or Kataoka. Claims 6-9, 11-14 and 15/6-21/6 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,763,981 to Okazaki et al. in view of Izukawa, Kataoka or Ohtsuchi. Additional art was cited of interest.

In accordance with the present response, the specification has been suitably revised to correct informalities and to place it in better conformance with U.S. practice. The title of the invention has been changed to "ULTRASONIC MOTOR AND ELECTRONIC APPARATUS EQUIPPED WITH ULTRASONIC MOTOR" to more clearly reflect the invention to which the claims are directed. Original claims 1-7, 8/7 and

9-14 have been amended to further patentably distinguish from the prior art of record. Claims 1-7, 8/7 and 9-14 have also been amended in formal respects to improve the wording thereof and to place them in better conformance with U.S. practice. Original claims 8/6, 13/11, 14/12, 17/1-17/9, 19/3, 19/4, 19/9, 20/19/3, 20/19/4, 20/19/9, 21/1-21/3, 21/5, 21/6, 21/11 and 21/12 have been rewritten as new claims 22-37 and 38-47 to correct the improper form of the multiple dependent claims. The language of these original claims has also been revised in formal respects to improve the wording. New claim 38 has been to cover the feature in original claim 6 of the detecting polarized portion being disposed symmetrical about the loop of the flexion vibration wave. Original claims 15-21 have been canceled. New claims 48-51 have been added to provide a fuller scope of coverage. Proposed drawing revisions have been submitted in Fig. 29A, and abstract has been substituted for the original abstract.

Applicants respectfully request reconsideration of their application in light of the following discussion.

The present invention is directed to an ultrasonic motor and to an electronic apparatus equipped with the ultrasonic motor.

An embodiment of the ultrasonic motor according to the present invention is shown in Figs. 6A-6B. The ultrasonic motor comprises a piezoelectric vibrating member 5 having a

detecting polarized portion 12c for detecting a drive signal having a drive frequency of the detecting polarized portion and a driving polarized portion 12a for receiving the drive signal to oscillate the piezoelectric vibrating member in self-excited oscillation to produce a drive force. The detecting polarized portion is disposed at a portion of the piezoelectric vibrating member 5 which undergoes maximum deformation in at least one vibration mode of oscillation of the piezoelectric vibrating member. An amplifying circuit 13 amplifies the drive signal detected by the detecting polarized portion 12c and input the amplified signal to the driving polarized portion 12a to oscillate the piezoelectric vibrating member 5.

Another embodiment of the ultrasonic motor according to the present invention is shown in Figs. 9-10. The ultrasonic motor comprises a piezoelectric vibrating member 16 having a detecting polarized portion 18c for detecting a drive signal having a drive frequency of the detecting polarized portion and a driving polarized portion 18a for receiving the drive signal to produce a flexion vibration wave for oscillating the piezoelectric vibrating member 16 in self-excited oscillation to produce a drive force. The detecting polarized portion 18c is disposed on the piezoelectric vibrating member 16 at a position symmetrical about a loop of the flexion vibration wave. An amplifying circuit 22

amplifies the drive signal detected by the detecting polarized portion 18c and inputs the amplified signal to the driving polarized portion 18a to oscillate the piezoelectric vibrating member 16.

In another aspect, the present invention is directed to an electronic apparatus. As shown in the embodiment of Fig. 32, for example, the electronic apparatus comprises a moving member 96 connected to a piezoelectric vibrating member 95 of an ultrasonic motor according to any of the foregoing embodiments of the present invention, an output mechanism 99, and a transmission mechanism 98 for transmitting movement of the moving member 96 to the output mechanism 99.

By the foregoing construction of the ultrasonic motor and electronic apparatus of the present invention, the arrangement of the detecting and driving polarized portions provide a self-excited oscillation driving circuit which has high stability and which is compact and economical to manufacture. Accordingly, the ultrasonic motor of the present invention can be rotated in with highly improved motor performance, stability and environmental reliability as compared to the complex control and driving circuits employed by the conventional art.

Applicants respectfully submit that the prior art of record does not disclose or suggest the subject matter recited in amended claims 1-7, 8/7, 9-14 and newly added claims 22-51.

Original claims 1-5, 10 and 21/1-21/3, 21/5 (now new claims 23, 25, 29, 34) were rejected under 35 U.S.C. §102(a) as being clearly anticipated by the references to Izukawa et al., Kataoka, Ohtsuchi et al., Takagi et al., Salomon et al., or Shirasaki. Applicants respectfully traverse these rejections and submit that the cited references do not disclose or describe the subject matter recited in amended claims 1-5, 10 and 21/1-21/3, 21/5 (now new claims 23, 25, 29, 34).

Amended independent claim 1 is directed to an ultrasonic motor and requires a piezoelectric vibrating member having a detecting polarized portion for detecting a drive signal having a drive frequency of the detecting polarized portion and a driving polarized portion for receiving the drive signal to oscillate the piezoelectric vibrating member in self-excited oscillation to produce a drive force. Claim 1 further requires that the detecting polarized portion is disposed at a portion of the piezoelectric vibrating member which undergoes maximum deformation in at least one vibration mode of oscillation of the piezoelectric vibrating member. Claim 1 further requires an amplifying circuit for amplifying the drive signal detected by the detecting polarized portion and inputting the amplified signal to the driving polarized portion to oscillate the piezoelectric vibrating member.

Amended independent claim 2 is also directed to an ultrasonic motor and requires a piezoelectric vibrating member having a detecting polarized portion for detecting a drive signal having a drive frequency of the detecting polarized portion and a driving polarized portion for receiving the drive signal to produce a flexion vibration wave for oscillating the piezoelectric vibrating member in self-excited oscillation to produce a drive force. Claim 2 further requires that the detecting polarized portion is disposed on the piezoelectric vibrating member at a position symmetrical about a loop of the flexion vibration wave. Claim 2 further requires an amplifying circuit for amplifying the drive signal detected by the detecting polarized portion and inputting the amplified signal to the driving polarized portion to oscillate the piezoelectric vibrating member.

Amended independent claim 3 is also directed to an ultrasonic motor and requires a piezoelectric vibrating member having a first driving polarized portion for generating a first flexion vibration wave, a second driving polarized portion for generating a second flexion vibration wave having a phase different from that of the first flexion vibration wave, and a detecting polarized portion disposed on the piezoelectric vibrating member at a position symmetrical about a loop of one of the first flexion vibration wave and the

second flexion vibration wave for detecting a drive signal having a drive frequency of the detecting polarized portion in accordance with oscillation of the first driving polarized portion. Claim 3 further requires an amplifying circuit for amplifying the drive signal detected by the detecting polarized portion and inputting the amplified signal to one of the first and second driving polarized portions.

Amended independent claim 5 is also directed to an ultrasonic motor and requires a piezoelectric vibrating member, a first driving electrode disposed on the piezoelectric vibrating member for generating a first flexion vibrating wave, and a second driving electrode disposed on the piezoelectric vibrating member for generating a second flexion vibration wave having a phase different from that of the first flexion vibration wave. Claim 5 further requires that the first and second flexion vibration waves generate oscillation for oscillating the piezoelectric vibrating member in self-excited oscillation to produce a drive force. Claim 5 further requires a first detecting electrode disposed on the piezoelectric vibrating member at a position symmetrical about a loop of the first flexion vibrating wave for detecting a drive signal having a drive frequency of the first detecting electrode in accordance with oscillation of the first driving electrode, a second detecting electrode disposed on the

piezoelectric vibrating member at a position symmetrical about a loop of the second flexion vibrating wave for detecting a drive signal having a drive frequency of the second detecting electrode in accordance with oscillation of the second driving electrode, and an amplifying circuit for amplifying the drive signal detected by the first or the second detecting electrode.

Thus amended independent claims 1-3 and 5 recite features which are not disclosed or described by Izukawa et al., Kataoka, Ohtsuchi et al., Takagi et al., Salomon et al., or Shirasaki. For example, Izukawa et al. and Salomon et al. do not disclose or describe a detecting polarized portion for detecting a drive signal having a drive frequency of the detecting polarized portion (claims 1-3) and disposed at a portion of the piezoelectric vibrating member which undergoes maximum deformation in at least one vibration mode of oscillation of the piezoelectric vibrating member (claim 1), as required by claims 1-3. Furthermore, Izukawa et al. and Salomon et al. do not disclose or describe a first detecting electrode for detecting a drive signal having a drive frequency of the first detecting electrode and a second detecting electrode for detecting a drive signal having a drive frequency of the second detecting electrode, as required by claim 5.

Kataoka, Takagi et al. and Shirasaki do not disclose or describe an ultrasonic motor having a self-oscillation circuit. Accordingly, these references do not disclose or describe a piezoelectric vibrating member having a detecting polarized portion for detecting a drive signal having a drive frequency of the detecting polarized portion and a driving polarized portion for receiving the drive signal to oscillate the piezoelectric vibrating member in self-excited oscillation to produce a drive force, as required by claims 1 and 2. Likewise, these references do not disclose or suggest a first driving electrode disposed on the piezoelectric vibrating member for generating a first flexion vibrating wave and a second driving electrode disposed on the piezoelectric vibrating member for generating a second flexion vibration wave having a phase different from that of the first flexion vibration wave, and that the first and second flexion vibration waves generate oscillation for oscillating the piezoelectric vibrating member in self-excited oscillation to produce a drive force, as required by claim 5.

Ohtsuchi et al. do not disclose or describe a self-oscillation circuit as required by claims 1, 2 and 5. Furthermore, Ohtsuchi et al. do not disclose or describe a detecting polarized portion for detecting a drive signal having a drive frequency of the detecting polarized portion

(claims 1-3) and disposed at a portion of the piezoelectric vibrating member which undergoes maximum deformation in at least one vibration mode of oscillation of the piezoelectric vibrating member (claim 1), and a first detecting electrode for detecting a drive signal having a drive frequency of the first detecting electrode and a second detecting electrode for detecting a drive signal having a drive frequency of the second detecting electrode (claim 5), as required by claims 1-3 and 5. In this regard, Ohtsuchi et al. discloses a vibration detection electrode for detecting an amplitude of vibration of a vibrating body, not a drive signal.

Since Izukawa et al., Kataoka, Ohtsuchi et al., Takagi et al., Salomon et al. and Shirasaki do not disclose or describe the subject matter recited in amended independent claims 1-3 and 5, as set forth above, there can be no anticipation by these references of amended independent claims 1-3 and 5 under 35 U.S.C. §102(a). That is, since each and every limitation of independent claims 1-3 and 5 is not found in Izukawa et al., Kataoka, Ohtsuchi et al., Takagi et al., Salomon et al. and Shirasaki, the references do not anticipate the claimed invention. See In re Lange, 209 USPQ 288, 293 (CCPA 1981). Furthermore, these references do not suggest the claimed subject matter and, therefore, would not have motivated one skilled in the art to modify the references to arrive at the claimed invention.

Claims 4, 10 and 21/1-21/3, 21/5 (now new claims 23, 25, 29, 34) depend on and contain all of the limitations of amended independent claims 1-3 and 5 and, therefore, distinguish from the references at least in the same manner as claims 1-3 and 5.

Claims 6-9, 11-14 and 21/6 (now new claim 37) were rejected under 35 U.S.C. §103(a) as being unpatentable over Okazaki et al. in view of Izukawa, Kataoka or Ohtsuchi. Applicants respectfully traverse this rejection and submit that the combined teachings of Okazaki et al., Izukawa, Kataoka and Ohtsuchi do not disclose or suggest the subject matter recited in claims 6-9, 11-14 and 21/6.

Amended independent claim 6 is directed to an ultrasonic motor and requires a piezoelectric vibrating member having a first driving polarized portion for generating a stretching vibration wave, a second driving polarized portion for generating a flexion vibrating wave, and a detecting polarized portion disposed at a position symmetrical about one of a node of the stretching vibration wave and a loop of the flexion vibration wave for detecting a drive signal having a drive frequency of the detecting polarized portion in accordance with oscillation of one of the first driving polarized portion and the second driving polarized portion. Claim 6 further requires amplifying means for amplifying the

drive signal detected by the detecting polarized portion and inputting the amplified signal to the first and second driving polarized portions for oscillating the piezoelectric vibrating member in self-excited oscillation to produce a drive force.

Amended independent claim 11 also is directed to an ultrasonic motor and requires a piezoelectric vibrating member, a driving electrode disposed on the piezoelectric vibrating member for undergoing vertical vibration to vibrate the piezoelectric vibrating member in self-excited vibration to produce a drive force, a detecting electrode for detecting a drive signal having a drive frequency of the detecting electrode in accordance with vibration of the electrode, and an amplifying circuit for amplifying the drive signal detected by the detecting electrode and inputting the amplified drive signal to the driving electrode to vibrate the piezoelectric vibrating member.

Amended independent claim 12 is also directed to an ultrasonic motor and requires a piezoelectric vibrating member, a driving electrode disposed on the piezoelectric vibrating member for undergoing torsional vibration to vibrate the piezoelectric vibrating member in self-excited vibration to produce a drive force, a detecting electrode for detecting a drive signal having a drive frequency of the detecting electrode in accordance with vibration of the driving

electrode, and an amplifying circuit for amplifying the drive signal detected by the detecting electrode and inputting the amplified drive signal to the driving electrode to vibrate the piezoelectric vibrating member.

Okazaki et al. do not disclose or suggest an ultrasonic motor having a self-oscillation or self-vibration circuit. Thus Okazaki et al. do not disclose or suggest amplifying means for amplifying the drive signal detected by the detecting polarized portion and inputting the amplified signal to the first and second driving polarized portions for oscillating the piezoelectric vibrating member in self-excited oscillation (claim 6), a driving electrode disposed on the piezoelectric vibrating member for undergoing vertical vibration to vibrate the piezoelectric vibrating member self-excited vibration (claim 11), and a driving electrode disposed on the piezoelectric vibrating member for undergoing torsional vibration to vibrate the piezoelectric vibrating member in self-excited vibration (claim 12), as required by claims 6, 11 and 12. Furthermore, Okazaki et al. do not disclose or suggest a detecting polarized portion disposed at a position symmetrical about one of a node of the stretching vibration wave and a loop of the flexion vibration wave for detecting a drive signal having a drive frequency of the detecting polarized portion (claim 6), and a detecting electrode for

detecting a drive signal having a drive frequency of the detecting electrode (claims 11, 12), as required by claims 6, 11 and 12.

The secondary references to Izukawa et al., Kataoka and Ohtsuchi et al. do not cure the foregoing deficiencies of Okazaki et al. and, therefore, one of ordinary skill in the art would not have been led to modify the reference to attain the claimed subject matter. For example, Izukawa et al., Kataoka and Ohtsuchi et al. do not disclose or suggest a detecting polarized portion disposed at a position symmetrical about one of a node of the stretching vibration wave and a loop of the flexion vibration wave for detecting a drive signal having a drive frequency of the detecting polarized portion (claim 6), and a detecting electrode for detecting a drive signal having a drive frequency of the detecting electrode (claims 11, 12), as required by claims 6, 11 and 12.

Claims 7-9, 13, 14 and 21/6 (now new claim 37) depend on and contain all of the limitations of amended independent claims 6, 11 and 12 and, therefore, distinguish from the references at least in the same manner as claims 6, 11 and 12.

Applicants respectfully submit that the prior art of record also does not disclose or suggest the subject matter recited in newly added claims 22, 24, 26-28, 30-33, 35, 36 and 38-51.

Claims 22, 24, 26-28, 30-33, 35 and 36-47 depend on and contain all of the limitations of independent claims 1-3, 5, 6, 11 and 12 and, therefore, distinguish from the references at least in the same manner as claims 1-3, 5, 6, 11 and 12.

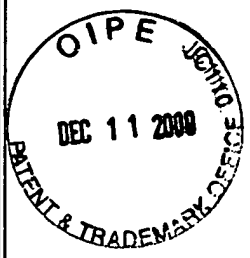
Newly added independent claim 48 is directed to an ultrasonic motor and requires a piezoelectric vibrating member, and a driving circuit for applying an exciting signal to the piezoelectric vibrating member to oscillate the piezoelectric vibrating member in self-excited oscillation. Claim 48 further requires that the driving circuit has a detecting electrode for detecting the exciting signal and disposed at a portion of the piezoelectric vibrating member for undergoing maximum deformation in at least one vibration mode of oscillation of the piezoelectric vibrating member, a driving electrode for receiving the exciting signal, and an amplifying circuit for amplifying the exciting signal detected by the detecting polarized portion and inputting the amplified signal to the driving polarized portion. No corresponding structural combination is disclosed or suggested by the prior art of record as set forth above for independent claims 1-3, 5, 6, 11 and 12.

In view of the foregoing, applicants respectfully submit that the application is now in condition for allowance.

Accordingly, favorable reconsideration and allowance of the claims are most respectfully requested.

Respectfully submitted,

ADAMS & WILKS
Attorneys for Applicants




By: _____
Bruce L. Adams
Reg. No. 25,386

50 Broadway
31st Floor
New York, NY 10004
(212) 809-3700

**MAILING CERTIFICATE**

I hereby certify that this correspondence is being deposited with the United States Postal Service as first-class mail in an envelope addressed to: Commissioner of Patents & Trademarks, Washington, D.C. 20231, on the date indicated below.

Bruce L. Adams
Attorney Name

December 4, 2000
Date

_____
Signature